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State Mining Bureau.

HENRY G. HANKS, State Mineralogist.

CONTRIBUTIONS
TO THE
Geology and Mineralogy
OF
CALIFORNIA,

By WILLIAM P. BLAKE.

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Rare Minerals

RECENTLY FOUND IN THE STATE.

H. G. Hanks, *State Mineralogist*, *California*:

Recognizing the importance to the State of the work in which you are engaged, and the gratifying measure of success which has already attended your efforts to establish a permanent geological and mineral collection, I take pleasure in offering you a series of written contributions upon the minerals and the geology of California. As these contributions will be based upon the observations I make in traveling through various portions of the State, and will often be written during the journeys, they will, of necessity, be somewhat desultory and informal, but I hope they will assist in making the varied and interesting geological features of California better known.

WM. P. BLAKE.

No. 1.

New Mineral Localities.

Erythyrite: Cobalt Bloom.—In minute mammillary incrustations, showing, when broken, radial aggregations of silky, fibrous crystals. Color: deep carmine or rosy-red, also, peach blossom red. Streak, the same color, but blue after the mineral has been heated. It gives the usual reactions for cobalt, arsenic and water. Occurs, also, in massive earthy aggregations, of small fibrous crystals of a rose-pink color. It is associated with an ore of silver and cobalt in dark-colored earthy masses, a mechanical mixture, assaying at the rate of 5,000 to 6,000 ounces of silver to the ton, but the precise nature of which is not yet ascertained, in a gangue of heavy spar, containing, also, nodular masses of chalcopyrite (yellow copper ore).

From the Bernardino range, Southern California. This is believed to be the first observation of the occurence of this species in the United States.

RUBELLITE: Rose-colored Tourmaline.—This very interesting mineral is now observed for the first time in California, in the form of long slender crystals from one sixteenth to one eighth of an inch in transverse diameter, with the usual triangular section. Color, a beautiful rose pink, contrasting well with the matrix of white lepidolite. When ignited the color disappears and the mineral becomes perfectly white. Infusible. Locality, Bernardino range, Southern California.

LEPIDOLITE—Occurs with the above in massive aggregations of minute pearly scales, both colorless and purple-red in color. It is traversed by the crystals of tourmaline. It fuses readily to a white enamel and colors the flame next to the assay a dark crimson-red for a moment.

CASSITERITE: "Wood Tin."—A single specimen of wood-tin, a segment of a botryoidal mass, with concentric structure and dark brown in color, was found by Mr. Thomas Lane, of Laporte, in the bed of the Middle fork of the Feather river, about three miles above Big Bar, Plumas County. The mass is about five eighths of an inch in diameter, and closely resembles the wood-tin brought from Durango, Mexico, and that found in Idaho. The attention of Placer miners should be directed to this, as other fragraments may be found in cleaning up sluices, and thus lead to the discovery of the source of this valuable ore of tin.

BORNITE: Variegated Copper Ore.—This beautiful ore of copper is found upon the claim of Mr. A. J. Ford, at Light's Canyon, Plumas County, in a vein affording massive specimens three inches or more thick. In the same region there are veins of yellow copper ore and of massive Hematite.

No. 2.

Section from Merced to Coulterville and Big Oak Flat.

From Merced station upon the Southern Pacific railroad, the line of section described in this contribution extends in a northeasterly direction, nearly transverse to the line of strike of some of the most interesting gold-bearing rocks of the Sierra Nevada.

Merced is situated upon the alluvial plains of the San Joaquin. The level and clay soil, noted for its fertility and adaptation to cereals, extends without change to the Six-mile house, where gravel begins to show itself and the soil is poorer and more arid. Another six miles over a gently rolling gravelly plain brings us to the banks of the Merced. Crossing by ferry to the right bank, we travel along the broad and rich bottom lands to Snellings and Merced Falls, passing plantations of Indian corn and cotton.

At Merced Falls, the first outcrop of the older rocks is observed. It is a hard bar of compact black clay slate, like roofing slate, very uniform in texture, in broad flat plates, standing vertically on edge, trending in remarkably straight lines northwest and southeast. This hard outcrop forms a natural dam, upon which the rapidly flowing water of the Merced has made but little impression. There is a fine water power at all seasons, which is partially utilized by a woolen mill. We here leave the river and ascend the hills to the northeast. The black slates carry numerous veins of white quartz which have not been much prospected.

A few miles beyond the falls, the surface rises rapidly, and the slates give way to harder rocks. These are light bluish-green in color, weathering in places almost white. They are evidently of sedimentary origin, though much altered and changed from their original condition. They form the outlying belt of a series of heavily bedded conglomerates, sandstones, and shales, which, being harder and less susceptible to erosion than the slates, form the high hills and ridges. These elevations trend northwest and southeast, and are probably the northwestern extension of the Mount Oso range, which traverses a large portion of Mariposa County, and forms the western wall of Bear Valley, on the Mariposa estate.

The heavy and bold outcrops of the massive conglomerates composing this range are not readily recognized as conglomerates. Their composite character is obscure. Generally it is scarcely possible to recognize that the rock is made up of rounded bowlder-like masses. The bowlders which form these rocks are so much compressed, welded, and united in one apparently homogeneous plasma that the dividing lines and contact surfaces are obliterated, and cannot be seen except upon surfaces that have been weathered and sometimes upon broad surfaces of fracture. Occasionally, where the metamorphic action has not been as strong as in other places, the original forms of the bowlders can be made out, and the masses stand out from the general surface. In decomposing, these old conglomerates reveal their origin by yielding a vast amount of hard bowlder-like masses, elongated and lens-shaped spheroids, which are utilized for fencing. There rocks are generally known and described as "greenstone," the color being light bluish green, and the mineral composition of the bowlders being like the greenstones. They offer a very interesting subject of study to the lithologist and to the student of dynamical geology. They border on each side the belts of slates in which most of the quartz veins are found and have, next to the granites, best withstood the denuding and wearing forces of the elements, and thus have to a great extent determined the topography of the piedmont region of the Sierra Nevada.

Upon the line of the section herein described, such conglomerates occur in a number of parallel outcrops with slaty rocks between and belts of sandstone, the exact succession of which cannot be determined without painstaking investigation. The whole series occupies a breadth of about twenty miles between the slates of Merced Falls and the similar slates of Coulterville Valley. It includes at least two bodies of well-defined pebbly conglomerates, in which the pebbles are small—not much larger than beans. These conglomerate beds lie parallel with bodies of argillaceous slate, and clearly demonstrate a succession of deposits formed in alternating deep and shallow waters. Approaching Coulterville we descend the hills of greenstone conglomerate and pass suddenly upon the black slates of the valley. They greatly resemble the outcrops at Merced Falls, and probably are a repetition of that series. Here, however, they are especially interesting, as the matrix of the two chief lines of gold-bearing veins in California, the so-called "mother lode" of the State. In this valley, as also upon the Mariposas and farther north, there are two nearly parallel lodes of great size, the croppings of which are so bold and prominent, crowning the hills, as to be visible for miles.

The western lode rises between walls of black slate, and carries films and sheets of the slates in its mass, giving to it a more or less stratified form and a striped appearance when seen in cross sections, or as it stands in the mines. Such quartz is technically known as ribbon quartz, and is a great favorite with quartz miners. In the mother lode proper, a short distance farther east, the quartz is more massive and solid, and is in close proximity to a belt of serpentine, and for a great part of its course follows and penetrates a stratum of magnesian rock, referable to ankerite and magnesite. It is characterized by rusty outcrops and an abundance of a foliated, bright green mineral to which the name "Mariposite" has been given. It appears to owe its green color to chromium and iron rather than to copper or nickel. The quartz penetrates this magnesian rock so thoroughly as to form in many places a complete network of veins branching off from the chief body.

Beyond the veins and magnesian belt the slates are seen again for a short distance, and are succeeded by greenstone conglomerates.

Beyond these, on the road to Big Oak Flat, there is a heavy body of syenite forming a hilly region traversed by the road for ten miles north and east to Priest's, on the Yosemite road. From Priest's, westward, there is a region of massive, hard black slates, which appear to belong to the series of formations in which the limestone belt of Sonora and the Hite group of veins occur. I regard them as older than the mother lode series of slates, and believe that they belong to the period of the carboniferous; the reasons in part for this belief being their stratigraphical relations to other formations and the abundance of carbonaceous matter which they contain.

The mother lode slates have been shown to correspond in age to the jurassic period. I am inclined to refer the greenstone conglomerate series to the trias.

The whole series of formations embraced in the section give satisfactory evidences of extensive plication and subsequent erosion. The dips are generally eastward and at a high angle.

No. 3.

Coulterville to Chinese Camp.

Leaving for the present a notice in detail of the mother vein, we follow its course approximately to Chinese Camp, near Sonora, in Tuolumne county.

COULTERVILLE TO PRIEST'S.

Crossing the line of the great vein at Coulterville, the road leads for a short distance over an outcrop of the heavy greenstone conglomerate, bordering the slates on the west. From that point to Priest's hotel, on the Yosemite road, a distance of ten miles, the rock formations are entirely different from those of the valley, being granite and syenite. The hills rise higher and the topography changes. The altitude at Coulterville is about 1,700 feet, and the road, upon the granite formation, is about 2,500 feet. Priest's is between 2,300 and 2,400 feet in altitude. The hills are but sparsely timbered and generally are wholly covered by a dense growth of chemisal. When this is in blossom, it never fails to remind one of the heather-covered downs of England, although it is comparatively gigantic in growth.

These high hills, which have been generally regarded as barren and worthless, are now being sought for and utilized for grain-growing and vineyards. Wherever water can be distributed over the surface, the granitic soil yields excellent crops of wheat. The vine takes kindly also to this soil and particularly where there is an excess of iron oxide, giving a red color to the earth. Probably the greenstone conglomerate hills are better than the granite. It is said that wherever the vines get well started they do not afterwards require irrigation. The fact that these hills can be covered with vineyards is extremely important as greatly extending the area of the vine-producing region of the State.

About midway between the points mentioned, the syenitic granite gives way for a short distance to a thin belt of gneissic rock and a metamorphic slate. These formations are bordered by felsites, which, in decomposing, have formed banks and layers of koalin, cut through by the graded road.

Near Priest's some gold-bearing quartz seams, or veins, have been found traversing the granite. These probably hold about the same relation to the veins of the slate belt as the veins in the granite at

West Point, farther north, do to the veins in the slates of Amador County.

SLATES AT PRIEST'S.

At Priest's we pass upon another and heavier belt of slaty rocks, which are more massive, harder, and appear older than the jurassic slates of Coulterville. This formation extends east and southeast from this point, and is probably the same body of hard black slates reaching southeast to Hite's Cove and beyond, carrying the celebrated Hite vein and others. These slates are regularly stratified, and appear to be traversed by dykes of trap or greenstone.

MOCCASIN CREEK.

From Priest's to the Tuolumne river at Stephen's Bar the road leads in a northwesterly direction. The granite and syenite appear to thin out, for directly after leaving Priest's the greenstone conglomerate takes its place. The road descends rapidly between high chemisal covered hills, underlaid by the conglomerates, to Culberton's in the valley, only a mile west of Priest's, and 1,300 feet lower.

At this point we are again upon the mother lode formation, and follow it down Moccasin creek to the Tuolumne. Looking back toward Coulterville, the view is interupted by the peak of Penyon Blanco, the crest of which is formed by the massive blocks of white quartz of the mother vein. About Culbertson's the vein is split up, and does not come boldly to the surface. Lower down the valley it appears in the foothills on the right bank, and on the left bank there are heavy outcrops of serpentine, extending nearly to the Tuolumne, where the slates are found largely developed. The mouth of Moccasin creek is only about 700 feet above tide. Running parallel as it does with the great vein for several miles, it might be expected to be rich in gold, which was the fact. It has been worked and reworked with profit, but now the gravelly bed is being leveled, and vineyards and orchards cover its surface and give a perpetual bonanza to the appreciative sons of Italy. The wonder is that more of our American young men and women do not avail of the many opportunities to make charming and profitable homes in the forsaken gold fields of California.

TUOLUMNE RIVER AND JACKSONVILLE.

We cross the river in a boat and follow the left bank for about two miles to Jacksonville, noted years ago for its figs and oranges. The general direction of the river corresponds with the strike of the formations, but it soon turns abruptly to the west and cuts across the slates and sandstones of the chief gold belt. Conglomerates and outcrops of serpentine with traces of the mother lode are also found; and these rocks continue, with a regular northwest trend, to Chinese Camp, eight miles southeast of Sonora. This place is situated in an open, gently rolling country, at an altitude of about 1,300 feet. Surface gold washings were very extensive in this vicinity, and sustained a large population of miners for years, but the diggings are now overgrown with grass, and many of the once well-filled stores are vacant.

No. 4.

Chinese Camp to Sonora.

In my last communication the course of the mother lode was followed from Coulterville to Chinese Camp, and it was shown that for most of the distance northwest of Penyon Blanco the lode does not crop out strongly, and appears at intervals only. The formations, however, continue unchanged, and the line of the lode is east of Chinese Camp.

SECTION TO JAMESTOWN.

Leaving Chinese Camp, and passing northeastward nearly at right angles to the strike of the rocks, we first cross the eroded outcrops of the conglomerates, and then over a belt of slates standing on edge, but presenting an almost flat surface, greatly resembling the outcrops at Merced Falls. This smooth and apparent planed-off outcrop is in strong contrast with the sharply serrated edges of the slates standing above the soil like tombstones, generally known among the miners as "grave-stone slates." The difference of surface is very likely due to a difference of internal grain; the absence of the elongated structure made by pulling or stretching the strata during the period of plication, to which we may refer the sharp ellipsoidal outcrops of the slates in a great part of the gold region.

Beyond these outcrops, north and west, there is a belt of greenstone conglomerate, succeeded by serpentine, apparently the prolongation of the serpentine belt traced northwestward from Coulterville and along the Tuolumne. Pliocene gravel also makes its appearance in remnants of a tableland formation; and a short distance beyond, the lava-capped beds of Table mountain bound the view from north to west.

MOTHER VEIN.

Thinly-bedded clay slates come to the surface east of the serpentine, and continue up to the outcrop of the mother lode, about one mile west of Jamestown. The lode at this place crops strongly, and forms the crest of a ridge, upon the flanks of which there are heavy deposits of quartz gravel, evidently derived from the disintegration of the vein. The many pits and trenches in this gravel clearly indicate its valuable auriferous character, and at the same time, show that the vein is not a mere barren outcrop of quartz.

The vein is accompanied by many branches and veinlets penetrating the adjoining slates in various directions. It follows the formation and trends northwest towards Table Mountain, under which it disappears. It would be interesting to ascertain what the fineness of the Table Mountain gold is, compared with the fineness of the gold from the vein. There can be little doubt that the Table Mountain deposit was greatly enriched below the mother vein by the gold broken from its croppings upon the banks and in the bed of the ancient river, along which the deposits and lava overflow of the present mountain were formed.

JAMESTOWN.

The lode is in the midst of the clay-slate formation which extends to and beyond Jamestown. East of this place the slates become harder, more massive, and are traversed occasionally by quartz veins. All the formations trend toward Table Mountain, and are there covered from view. As the slates become harder, the surface of the country rises from 1,400 feet elevation at Jamestown to nearly 1,800 feet at Sonora. This may be due in part to a very hard dyke of dioritic rock just west of the town. Sonora is built upon hard, massive black slates, resembling those beyond Priest's, and at the Hite mine, belonging, I believe to the most eastern belt of slates of the Sierra; these black argillaceous slates are firm and hard enough to be quarried for building purposes. They are gold-bearing, and, at the present time, there is a most notable development of a vein within the town limits, from which fabulous amounts of gold are taken by two men, the metal being so abundant that but little crushing in a hand mortar is required to free it from quartz.

SONORA LIMESTONE.

The limestones at Sonora, bordering the slate formation on the east, constitute one of the most interesting geological formations of the State. They are here developed over a considerable area and stretch for many miles to the northwest, to Columbia, Shaw's Flat, Murphy's, and beyond; and southeastward it is believed to reach to Hite's Cove and beyond it, though I have not traced them in that direction. In a section which I shall hereafter give, from Mariposa to Hite's Cove, I shall show the similarity of the formations; that there are several distinct strata, or beds, and that some of them abound in fossil encrinites. The Sonora outcrops have failed, so far as I know, to give any evidence by fossils of their age or place in the geological scale. There is no doubt, however, of their deep-sea marine origin. They show distinct stratification and alternate layers of gray, white, and blue color. The stratification is nearly vertical and the beds being of differing degrees of solubility now present a very extraordinary and uneven surface, especially where in the flats and valleys they were covered with alluvial gravels and clays. In such places, notably in Columbia and Shaw's Flat, the outcrop consists of a succession of sharp, irregular bodies of limestone, separated by deep, fissure-like chasms. The masses, in many instances, seem like loose bowlders, and where the soil and gravel were removed by mining, they toppled over. Such a surface proved to be wonderfully retentive of placer gold, and the harvest from this strangely irregular surface of limestone was very great. Miners have worked the crevices to great depth, and there is reason to believe that the bottom of many of the chasms has never been reached. A similar formation occurs in the Ural mountains, and was described by Sir Roderick Murchison. A reference to this and a more complete notice of the Sonora deposits, with figures, will be found in my report to the United States Government in 1853 to 1855.

The cause of the uneven surface is not as generally supposed, mechanical wearing away, or erosion, but is chiefly chemical. It is due to the solvent action of carbonated water percolating through the soil or standing in the undrained and swamp-like flats. As the rock was dissolved the gravel and gold sank down into the cavities and crevices far below the surface upon which they were originally laid down.

PLIOCENE FOSSILS.

At the time of my first visit, in 1854, the whole limestone belt was populous with miners, and many relics of the Pliocene age were brought to light and were often lost to history and science. These for the most part consisted of teeth of elephants, the mammoths, and of the mastodons of primeval days, when they roamed through the forest and glades of California with the tapir and hipparion. Whether the progenitors of the modern Digger Indians were "there to see" is still an open question, though some cracked skulls are thought to bear evidence on this part.

RELICS OF HUMANITY.

The late Dr. Snell, of Sonora, was an enthusiastic collector of aboriginal stone implements and relics which have been peculiarly abundant about Table Mountain, and were supposed by the doctor to be of great age, even antedating the lava flow. This, however, is very doubtful. As the subject is very interesting, and the facts are important in the discussion of the antiquity of man upon the globe, I propose to make them the basis of a separate contribution.

Since the death of Dr. Snell, his collection appears to have been scattered. I did not find in Sonora any one who could give me an account of it. Casts of some of the specimens have been sent to the Smithsonian Institute; and the doctor presented me with a collection of specimens some years before his death. At the same time, I made exact drawings of some of the more important pieces, copies of which I will send you for publication in your annual report.

No. 5.

Occurrence of Vanadates of Lead at the Castle Dome Mines.

The occurrence of the rare mineral *vanadinite* at the Castle Dome mines is sufficiently interesting to receive a special notice in this series, although the locality is just beyond the line of the State, across the Colorado river, and in the Castle Dome district, Arizona.

During my recent visit to that district I collected a variety of specimens with the intention of preparing a full memoir upon the species, and its association with Wulfenite and the other beautiful ores of the Castle Dome veins, but as the box containing the material has not arrived I must be content with sending you this preliminary notice.

Vanadinite, which occurs in considerable abundance in the claim known as the "Railroad," is a rare mineral, and has not hitherto been found in the United States, if we except some minute microscopic crystals mixed with Wulfenite found in the ores of the Wheatley mines, at Phœnixville, Pennsylvania, and referred to the species Descloizite, also a vanadate of lead.

The vanadinite occurs in groups of hexagonal prismatic crystals with curved sides, tapering at each end, and closely resembling pyromorphite in form and grouping. These crystals are rarely over one sixteenth of an inch in diameter, being generally half that size and less than three sixteenths long. They are in confused aggregations, forming crusts and filling cavities in the decomposing ores of lead, and also on fluor-spar. Some of the crystals are cavernous, presenting the appearance often seen in phosphate of lead. One side of a crust of crystals is often in distinct hexagonal crystals, and the other consists of an aggregation of minute crystals grouped in arborescent forms, and differing in color from the coarser crystals. The larger crystals are generally light brown in color, with a bronzy luster. The smaller crystals are lighter, and are of various shades of orange yellow, becoming in places nearly white with a silvery satin-like luster, due possibly to a pellicle of some other mineral covering the surface. The yellowish brown crystals have a wax-like appearance and luster.

The difference in appearance in the crystalline crusts, their difference of aggregation and color, suggest the probability of several species. It is possible that Dechenite, Descloizite and Mimetite are represented; also Eusynchite. The behavior with nitric acid is different, some crystals showing a distinct separation of red vanadic acid, and others giving but a slight reaction.

The Wulfenite crystals in association are extremely brilliant and light yellow in color, presenting a beautiful appearance upon a background of green fluor-spar, or white crystalline carbonate of lead.

There is great need of investigation of the composition of the many varieties of yellow, red, and brown crystals from Castle Dome and Silver district, now usually referred to Wulfenite, though it is probable that several species are represented.

The Castle Dome vanadinite is totally different in appearance from the red crystals of Silver district. At Castle Dome the vanadium appears to be present in varying proportions in the crystals of different appearance, though all hexagonal, and to be associated with arsenic acid in the mineral species, Mimetite.

MIMETITE.

Some of the specimens giving strong arsenical odors on coal and having the external characters of mimetite or arsenate of lead, give also characteristic reactions for vanadic acid, though not to the same degree, or so distinctly as other crystals where the arsenical reactions are weaker. The strongest reactions for arsenic, so far obtained, are from the crusts of small aggregated crystals of a light brown or straw-yellow color and wax-like luster. The deportment with nitric acid varies, but all the varieties dissolve and give finally yellow solutions, which become green and blue where deoxidized by organic acids or alcohol. The occurrence of vanadic acid in mimetite is not unknown, Domeyko having found it in mimetite from Mina Grande, Chile.

In all of the specimens so far examined, whether the light yellow, barrel-shaped crystals, or the long, tapering, hexagonal prisms, or the dendritic aggregates, reactions for chlorine are obtained, and the yellow nitric solutions become green by heating with alcohol.

It is interesting to note here that recent researches by M. Bertrand go to show that the hexagonal crystals of mimetite are compound crystals, made up by twinning of orthorombic crystals. This has been shown by the study of the optical characters. While pyromorphite is truly hexagonal, showing only one axis of symmetrical polarization, mimetite was found to have two optic axes. It is possible that we may find crystals large enough from Castle Dome or Silver district to examine with the polariscope, and ascertain whether they are in reality compounded or single.

VANADINITE AT SILVER DISTRICT.

Vanadinite also occurs in beautiful crimson red crystals in the Hamburg mine at Silver district. These crystals are small, but are beautifully distinct hexagonal prisms or "berylloids," being similarly shaped, and are terminated by a flat plane at right angles with the planes of the prism. The terminal edges are replaced by a minute brilliant plane, and in one or two of the crystals a plane replacing one of the solid angles has been observed. The material at hand is insufficient to give me the best specimens for examination by the goniometer, so as to accurately measure the inclination of these terminal planes to the base or sides. I have, however, mounted one of the minute crystals in hand, and find the angles of the prism apparently equal, so there is little doubt of its truly hexagonal form. The seemingly partial termination or modification of the terminal edges in some crystals raised the question whether, though apparently hexagonal, the true form might not be rhombic.

The streak or powder of this mineral is salmon-colored or orange red.

It dissolves completely in dilute nitric acid, but in strong nitric acid, if added in small quantities, there is a separation of a red powder, which floats off in the acid and is then dissolved, giving a yellow solution, which, after standing some hours, becomes green. It is also turned green in a few moments by the addition of a small quantity of alcohol, and this green solution, on boiling, turns blue. These reactions are characteristic of vanadic acid.

With microcosmic salt in the outer blowpipe flame, we obtain a yellowish green glass, which in the reducing flame is changed to an emerald green when cold.

With borax in the outer flame an olive brown bead results. Strong reactions for chlorine are obtained by the silver test.

Some of the crystals are light amber colored and are transparent, and some of them are much darker in color near the terminal plane than at the foot of the prism where it adheres to the gangue.

VANADIC MOLYBDATES.

In the Red Cloud mine at Silver district and likewise at the Silver Glance mine numerous fine specimens of tabular crystals of Wulfenite have been procured from time to time for the past two years. These crystals are often half an inch across, and are from one sixteenth to one eighth of an inch thick. The chief peculiarity is their fine red color, very different from that of ordinary molybdate of lead and contrasting strongly with the yellow Wulfenite crystals from the same localities, and from those also of Castle Dome. These red crystals I provisionally refer to the vanadiferous variety of Wulfenite. A complete analysis is, however, needed to show the composition of this and other allied varieties found in other claims at Silver district, notably at the mines opened by Bamber & Sons—"The Oakland Boys' claim."

The first red crystals of Wulfenite observed in the United States were extremely small, being almost microscopic, and were implanted on the ores from the Wheatley mine, at Phœnixville, Pennsylvania. They were found by the writer, and the red color was at first supposed to be due to chromic acid, but when the mineral was procured in quantity sufficient for analysis, Professor J. Lawrence Smith showed that the red color was due to the presence of vanadic acid. The Silver district specimens now afford sufficient material to permit of a quantitative determination of the constituents.

OCTAHEDRAL CRYSTALS.

Beautiful octahedral crystals, of a reddish-brown color, are obtained at the Oakland Boys' claim. I regard these as another vanadic mineral, possibly a vanadic variety of Wulfenite; though the form and the color are so different from the form and color of undoubted Wulfenite in the same district, I am inclined to regard it as a distinct species, or, at least, a well characterized variety. I regret that the specimens I expected have not arrived, thus preventing my making tests and giving a specific description.

I am indebted to Mr. Wm. P. Miller, the general superintendent of the Castle Dome mines and the smelting works at Melrose, for assistance in procuring some of the specimens which I have been describing. Some were obtained by me at the mines, April, 1880, and others at the time of my last visit to the mines this past spring.

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